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ABSTRACT

A statistical analysis was made of the most productive term-formation processes in English, German, French, and Russian in the field of chemistry. The study deals with (1) the morphological aspect of term-formation, that is, the most productive affixes involved in term-formation in the four languages; and (2) the syntactical aspect, that is, the type of syntactic structure involved in the formation of complex terms. Examples are provided of the data and results in the field of spectroscopy, a subfield of chemistry. These are a list of affixes in the four languages arranged according to their productivity as well as according to the type of concept they designate. Results are given also on the syntactical aspect. These involve a listing of the syntactical structures of complex terms in the four languages arranged according to their productivity. The study and its results are applied to the field of language for special purposes (LSP) reading courses. It is suggested that instruction center on term-formation processes because a good knowledge of these would improve the reading skill necessary for reading scientific literature in the foreign language. (Author/AMH)

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A COMPARATIVE ANALYSIS OF PRODUCTIVE MORPHOLOGICAL AND MORPHOSYNTACTICAL TERM-FORMATION PROCESSES IN ENGLISH, GERMAN, FRENCH AND RUSSIAN AND THEIR IMPORTANCE IN ACQUIRING READING SKILLS IN FOREIGN LSP

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1. Introduction

According to a study done by Unesco, 50% of the annual growth in scientific and technical literature is written in languages that only half the scientists are able to read (Holstrom as quoted by W. Hornung 1965:1). Language learning for scientists thus seems of utmost importance with respect to international scientific collaboration and progress. However, as Locke (1957:150) points out, "... a realistic view of the time available to our science and engineering students in the United States leads to the conclusion that they will only do the minimum of study necessary to read what they must read".

2. The TSP (Teaching for Special Purposes) Principle

The question arises as to how FL (Foreign Language) reading courses for specialists can be planned as efficiently as possible. G. Rondeau (1979:75) claims that the solution to pedagogical and methodological aspects of LSP teaching resides in the application of a very simple principle: what to teach and how to teach in second language didactics is determined by a precise delimitation and analysis of a given group of learners in a given situation. In other words, efficiency in FL LSP teaching requires special methods adapted to a clearly defined aim. This is what we will call the TSP principle.

3. FL Reading Objectives for Scientists

The TSP principle involves two components, a precise delimitation of the reading objectives for scientists on the one hand, and a special FL reading methodology on the other. Let us first of all have a look at the first component and analyze the specific reading objectives for scientists. Our hypothesis is that the principal aim of scientists who want to have access to foreign documentation is, above all, to acquire a scanning ability, which later on, can be extended to a true reading ability:

> It is in fact an immensely valuable practical accomplishment for him [the scientist], even if he cannot understand the whole of a foreign article, to be able to at least make out the gist and decide for himself whether it is worth having any of it translated or elucidated by a better linguist. (Unesco, 1957:144-145)

4. FL Reading Methodology for Scientists

Let us now have a look at the second component of the TSP principle, namely the special FL reading methodology. The specialist-reader brings something to the reading activity which even a native non-specialist does not have, namely the knowledge of his subject field. We must exploit this tremendous advantage a scientist has, since, as pointed out in Unesco (1957:146), "if the concepts are already understood, the unfamiliar names applied to those concepts in the foreign languages are soon picked up and help to clarify the less technical passages of the text". An efficient FL LSP reading course for professional purposes will thus take the foreign LSP terminology as a starting point and then extend to paraterminology, that is to say to language-elements other than LSP terminology.

5. FL LSP Teaching Material

It is commonly agreed upon that a good knowledge of term-formation processes improves the reading skills necessary for reading foreign LSP. However, as L. Hoffmann (1976:258) points out, so far not much attention has been paid to the fact that the productivity of term-formation processes is of great importance (cf. also L. Hoffman & R.G. Piotrowski, 1979:182; 193-194). The analysis of the latter permits a substantial reduction of the teaching material.

5.1 Methodology for Determining the Productivity of Term-Formation Processes

In order to determine the productivity of term-formation processes in four of the terminologically most active languages, we have undertaken a comparative analysis of morphological and morphosyntactic term-formation processes in English, German, French and Russian.[1] We determined the most productive term-formation processes in each of the four languages by means of statistical methods. The 3 500 English terms and their German, French and Russian equivalents making up the corpus[2] were given a numerical code according to their morphological and morphosyntactic formation and their conceptual content. To illustrate our method of coding, below is an example of a coded term in each of the four languages.

Coding examples:

En	leak tester		
1. Conceptual category:		equipment	(3)
2. Morphological category:		adjectival prefix	(00)
		adjectival suffix	(00)
		nominal prefix	(00)
		nominal suffix	(10)
3. Morphosyntactic category:		S + S	(001)
De	Mattscheibe		
1. Conceptual category:		equipment	(3)
2. Morphological category:		adjectival prefix	(00)
		adjectival suffix	(00)
		nominal prefix	(00)
		nominal suffix	(00)
3. Morphosyntactic category:		A + S	(007)

Fr densité du rayonnement

1. Conceptual category:	properties	(2)
2. Morphological category:	adjectival prefix	(00)
	adjectival suffix	(00)
Main nominal constituent	nominal prefix	(00)
	nominal suffix	(16)
Secondary nominal constituent	nominal prefix	(00)
	nominal suffix	(04)
3. Morphosyntactic category:	S + prep. de + D + S	(010)

Ru élektronnaja lampa dlja stabilizacii naprjaženija

1. Conceptual category:	equipment	(3)
2. Morphological category:	adjectival prefix	(00)
	adjectival suffix	(02)
Main nominal constituent	nominal prefix	(00)
	nominal suffix	(00)
Secondary nominal constituent	nominal prefix	(00)
	nominal suffix	(10)
3. Morphosyntactic category:	A + prep. dlja + S + S	(016)

The numbers following the conceptual category as well as the morphological and morphosyntactic categories correspond to their numerical codes. The number of digits; one digit for the conceptual category, two digits for the morphological category and three digits for the morphosyntactic category, indicates that the number of elements in each category is inferior to 10, 100 and 1000 respectively. The numerical values of the codes, apart from (0), (00) and (000) indicating an absence of the element in question, are purely arbitrary since they describe a particular listing of the elements in each category. The order of these elements is not significant.

Once we finished the coding of the 14 000 terms the numerical data was entered into the computer (IBM 370/158). The SPSS programme enabled us to obtain three types of listings: basic frequency lists (SPSS procedure:FREQUENCIES), multiple frequency lists (SPSS procedure:MULT RESPONSE) and cross tables (SPSS procedure:CROSSTABS). One type of cross table contained the conceptual categories and the morphological categories, which enabled us to observe which type of concept is designated by which type of suffix. The other type of cross table contained the morphological category of each language with respect to the corresponding morphological category in English, which gave us the most frequent corresponding suffixes with respect to English.

5.2 Results

5.2.1 Morphological Term-Formation Processes

Results on the morphological term-formation processes involve an exhaustive listing of the productive affixes as well as the correspondances between the suffixes in the four languages. They are arranged according to their productivity as well as according to the type of concept they designate. For example,[3] the suffixes most frequently used to designate processes in the four languages are:

		example:	absolute frequency:	%
En	-ion	accumulation	149	46.708
	-ing	grinding	132	41.379
	-ment	electron detachment	34	10.658
	-ure	exposure	4	1.255
De	-ung	Randentladung	335	80.529
	-en	Vorfunken	52	12.500
	-ion	Desoxydation	29	6.971

		example:	absolute frequency:	%
Fr	-ion	atomisation	178	57.980
	-ment	accouplement	76	24.756
	-age	réglage	53	17.264
Ru	-eni-	poslevečenie	201	51.671
	-k-	dobavka	74	19.023
	-ani-	obratnoe rassejanie	69	17.738
	-i-	gravimetrija	33	8.483
	-aci-	kondensacija	12	3.085

The suffixes most frequently used to designate properties in the four languages are:

		example:	absolute frequency:	%
En	-ity	heterogeneity	56	53.333
	-ion	diffraction	42	40.000
	-th	pass band width	4	3.810
	-y	accuracy	3	2.857
De	-keit	Dichtigkeit	66	35.676
	-ung	Resonanzspannung	27	14.590
	-en	Beugungsvermögen	24	12.973
	-tät	Passivität	22	11.892
	-ion	Diffraktion	20	10.811
	-e	Bildschärfe	19	10.274
	-heit	Reinheit	7	3.784
Fr	-ité	sûreté	61	45.865
	-ion	diffraction	30	22.556
	-ance	impédance	25	18.797
	-esse	vitesse de diffusion	13	9.774
	-eur	largeur de la veine	4	3.008

		example:	absolute frequency:	%
Ru	-ost	passivnost'	137	62.273
	-eni-	napravlenie lučej	57	25.909
	-i-	diffrakcija sveta	18	8.182
	-ani-	rasstojanie do kondensora	8	3.636

The suffixes most frequently used to designate equipment are:

En	-er	adapter	132	45.361
	-or	accumulator	98	33.671
	-ing	source housing	26	8.935
	-ment	laboratory equipment	14	4.811
	-ion	installation	13	4.467
	-ette	micropipette	8	2.749
De	-er	Stromregler	176	46.933
	-ung	Röntgeneinrichtung	86	22.933
	-or	Exksikator	84	22.400
	-ette	Mikroküvette	29	7.734
Fr	-eur	enregistreur numérique	191	77.016
	-age	appereillage de ventilation	24	9.677
	-ette	éprouvette	22	8.871
	-et	creuset de platine	6	2.419
	-oir	entonnoir	5	2.017
Ru	-or	kompressor	128	33.161
	-atel' -itel'	oslabitel'	103	26.684
	-ik	priemnik	44	11.399
	-eni-	slangovoe soedinenie	27	6.995

	example:	absolute frequency:	%
-et-	protocnaja kjuveta	24	6.218
-stv-	ekranirujuscee ustrojstvo	23	5.959
-k-	voronka	16	4.145
-ok	vyhodnoj zracok	15	3.886
-ovk-	rentgenovskaja ustanovka	6	1.533

5.2.2 Morphosyntactic Term-Formation Processes

As for the morphosyntactic term-formation processes, the most productive morphosyntactic structures of complex terms were analyzed and also compared to their equivalents. Results involve an exhaustive listing of morphosyntactic structures which are arranged according to their productivity [3].

According to the results obtained about 80% (En 82.8%, De 83.5%, Fr 80.9%, Ru 80.9%) of the terms analyzed are complex terms. 50 % (except for Russian 30%, En 52%, De 53%, Fr 48%) of all terms are formed by combining two nouns with or without a preposition. Below are listed the prepositions most frequently used to combine the two nouns in complex terms:

	prep.	example:	absolute frequency:	%
En	of	aberation of focusing	176	81.860
	for	specification for analysis	9	4.186
	by	adjustment by shims	7	3.255
	in	defect in grating	4	1.860
	between	distance between lines	4	1.806
	against	protection against heat	3	1.395
	on	residue on filter	3	1.395

	prep.:	example:	absolute frequency:	%
	with	flushing with argon	2	0.930
	to	exposure to light	2	0.930
	due to	error due to grain	2	0.930
	from	freedom from leaks	2	0.930
	per	lines/mm	1	0.465
			215	100%
De	von	Gruppe von Kurven	6	35.294
	auf	Einstellung auf Null	2	11.764
	nach	Verschiebung nach Rot	1	5.882
	nach	Transformation nach Seidel	1	5.882
	mit	Auswertung mit Leitproben	1	5.882
	pro	Striche/mm	1	5.882
	ohne	Auswertung ohne Leitproben	1	5.882
	durch	Anregung durch Stoss	1	5.882
	an	Anlegen an Erde	1	5.882
	für	Mischeinrichtung für Gase	1	5.882
	in	Darstellung in Kurvenform	1	5.882
			17	100%
Fr	de	bande d'absorption	802	82.172
	à	tronçonneuse à disque	79	8.094
	en	trajet en spirale	43	4.405
	par	analyse par spectrographie	28	2.868
	pour	cuvette pour liquides	12	1.229

	prep.	example:	absolute frequency:	%
Fr	en forme de	diaphragme en forme de peigne	6	0.614
	sur	enregistreur sur papier	3	0.307
	sous forme de	représentation sous forme de courbe	2	0.204
	sous	moulage sous pression	1	0.102
			976	100%
Ru	dlja	ugol' dlja pogloščenija	21	22.580
	na	naprjaženie na anode	16	17.204
	v	koncentracija v fikspunkte	11	11.828
	s	srodstvo s elektronom	10	10.752
	po	dviženie po krugu	9	9.677
	meždu	rasstojanie meždu linijami	8	8.602
	ot	zaščita ot pomeh	6	6.451
	iz	prizma iz kronglasa	3	3.225
	pri	poteri pri vyhode	3	3.225
	k	prisoedinenie k seti	3	3.225
	pod	lit'e pod davleniem	1	1.075
	do	rasstojanie do kondensora	1	1.075
	čerez	prohoždenie čerez nul'	1	1.075
			93	100%

5.3 Implications for FL LSP Teaching

Statistical methods enabled us to pinpoint in an objective fashion the most productive affixes as well as the most productive morphosyntactic structures in the field of spectroscopy. Various analyses of term-formation processes in other fields have revealed that there is a basic nucleous of productive morphological and morphosyntactic structures common to all LSP (cf. L. Hoffmann:1976). The methodology described above and the results obtained will therefore prove very useful in determining the most productive term-formation processes to be included in the FL LSP teaching material as well as in reducing the teaching material to a minimum.

6. Conclusion

A closer analysis of the TSP principle has shown that the ability to scan or search articles in foreign languages should be the first aim in FL reading courses for scientists. Scanning foreign articles presupposes an understanding of the foreign terminology. A knowledge of the most productive morphological and morphosyntactic term-formation processes will help the scientist to decode the foreign terminology. As E. Reid (1970:3) points out rightly: "When he finds some familiar symbols and words, he can figure out what process is described and compare it with what he already knows about the subject. With this beginning, he can continue by whatever means he finds necessary".

This is the very foundation with which we must start if we want to arrive at an efficient way of satisfying the need of scientists for reading foreign scientific literature.

NOTES

1) cf. our doctoral thesis entitled Étude sur la création néonymique, under the direction of Guy Rondeau, professor of terminology at Laval University, Quebec City, Canada, 1983.

2) The Dictionary of Spectroscopy and Spectral Analysis (English, German, French, Russian with a supplement in Spanish), Berlin, VEB Verlag Technik Berlin, Pergamon Press, 1971, was used as a corpus.

3) As it would go beyond the scope of the present paper to list exhaustive results of our study, we will merely give extracts to illustrate the type of result obtained. For further information see our doctoral thesis Étude sur la création néonymique, Laval University, Quebec City, Canada, 1983.

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